



#4

SEQUENCE LISTING

<110> Hallahan, David
Keiper-Hrynko, Natalie

<120> Genes Involved in the Biosynthesis of Isopentenyl Diphosphate in
Hevea brasiliensis Latex

<130> CL1792 US NA

<150> 60/307,637
<151> 2001-07-25

<160> 16

<170> Microsoft Office 97

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<212> DNA

<213> Hevea brasiliensis

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ccagcacttg cgatacaaaa agctatttca aatgctgggt tggaggcttc ccagattgat	960
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<212> DNA

<213> Hevea brasiliensis

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<210> 3

<211> 1974

<212> DNA

<213> Hevea brasiliensis

<400> 3

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<211> 1158

<212> DNA

<213> Hevea brasiliensis

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tcatggccaa ttggtagaat cagagaggca ttatctaact taggtgctcc ttctcttca	240
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aatatcccag aggcaaaaat tgcactcact tctggagtgt cagccttttt atggttatat	360
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cttgaattat taaacaaatg ggctctcgaa ggtgaaaaga taattcatgg aaagccatct	600
ggaatagaca aactgtcag cgcataatgg aacatgatca agttcaagtc tggtaatctg	660

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<212> DNA

<213> Hevea brasiliensis

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<212> DNA

<213> Hevea brasiliensis

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<211> 696

<212> DNA

<213> Hevea brasiliensis

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<210> 8

<211> 411

<212> PRT

<213> Hevea brasiliensis

<400> 8

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Phe Ser Ala Thr Lys Leu Gly Ser Ile Ala Ile Gln Ala Ala Leu Lys
 35 40 45
 Arg Ala Asn Val Asp Pro Ser Leu Val Gln Glu Val Phe Phe Gly Asn
 50 55 60
 Val Leu Ser Ala Asn Leu Gly Gln Ala Pro Ala Arg Gln Ala Ala Leu
 65 70 75 80
 Gly Ala Gly Ile Pro Asn Ser Val Ile Cys Thr Thr Ile Asn Lys Val
 85 90 95
 Cys Ala Ser Gly Met Lys Ala Thr Met Leu Ala Ala Leu Thr Ile Gln
 100 105 110
 Val Gly Ile Asn Asp Ile Val Val Ala Gly Gly Met Glu Ser Met Ser
 115 120 125
 Asn Ala Pro Lys Tyr Leu Ala Glu Ala Arg Arg Gly Ser Arg Leu Gly
 130 135 140
 His Asp Thr Ile Ile Asp Gly Met Leu Lys Asp Gly Leu Trp Asp Val
 145 150 155 160
 Tyr Asn Asp Phe Gly Met Gly Val Cys Ala Glu Ile Cys Ala Asp Gln
 165 170 175
 His Asn Ile Thr Arg Glu Glu Lys Asp Ser Tyr Ala Ile Arg Ser Phe
 180 185 190
 Glu Arg Gly Asn Ser Ala Gln Asn Gly Gly Val Phe Ser Trp Glu Ile
 195 200 205
 Val Pro Val Glu Val Ser Gly Gly Arg Gly Lys Ser Val Met Val Val
 210 215 220
 Asp Lys Asp Glu Gly Leu Ile Lys Phe Asp Ala Ala Lys Leu Arg Lys
 225 230 235 240
 Leu Arg Pro Ile Ser Arg Ile Gly Ser Val Thr Ala Gly Asn Ala Ser
 245 250 255
 Ile Ile Ser Asp Gly Ala Ala Ala Leu Val Leu Val Ser Gly Glu Lys
 260 265 270
 Ala Ile Glu Leu Gly Leu Gln Val Ile Ala Arg Ile Arg Gly Tyr Gly
 275 280 285
 Asp Ala Ala Gln Ala Pro Glu Leu Phe Thr Thr Ala Pro Ala Leu Ala
 290 295 300
 Ile Pro Lys Ala Ile Ser Asn Ala Gly Leu Glu Ala Ser Gln Ile Asp
 305 310 315 320
 Tyr Tyr Glu Ile Asn Glu Ala Phe Ser Val Val Ala Leu Ala Asn Gln
 325 330 335
 Lys Ile Leu Gly Leu Asn Pro Glu Lys Leu Asn Val His Gly Gly Ala
 340 345 350
 Val Ser Leu Gly His Pro Leu Gly Cys Ser Gly Ala Arg Ile Leu Val
 355 360 365

Thr Leu Leu Gly Val Leu Arg His Lys Asn Gly Lys Tyr Gly Val Ala
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Ser Ile Cys Asn Gly Gly Gly Gly Ala Ser Ala Leu Val Leu Glu Leu
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Met Ser Val Gly Arg Val Gly Arg Ser Leu Leu
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<210> 9

<211> 464

<212> PRT

<213> Hevea brasiliensis

<400> 9

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Gly Lys Tyr Thr Ile Gly Leu Gly Gln Asp Cys Met Ala Phe Cys Thr
 35 40 45

Glu Val Glu Asp Val Ile Ser Met Ser Leu Thr Ala Val Thr Ser Leu
 50 55 60

Leu Asp Lys Tyr Asn Ile Asp Pro Lys Gln Ile Gly Arg Leu Glu Val
 65 70 75 80

Gly Ser Glu Thr Val Ile Asp Lys Ser Lys Ser Ile Lys Thr Phe Leu
 85 90 95

Met Gln Ile Phe Glu Lys Phe Gly Asn Thr Asp Ile Glu Gly Val Asp
 100 105 110

Ser Thr Asn Ala Cys Tyr Gly Gly Thr Ala Ala Leu Phe Asn Cys Val
 115 120 125

Asn Trp Val Glu Ser Ser Ser Trp Asp Gly Arg Tyr Gly Leu Val Val
 130 135 140

Cys Thr Asp Ser Ala Val Tyr Ala Glu Gly Pro Ala Arg Pro Thr Gly
 145 150 155 160

Gly Ala Ala Ala Ile Ala Ile Leu Val Gly Pro Asp Ala Pro Ile Ala
 165 170 175

Phe Glu Ser Lys Phe Arg Gly Ser His Met Ser His Ala Tyr Asp Phe
 180 185 190

Tyr Lys Pro Asn Leu Ala Ser Glu Tyr Pro Val Val Asp Gly Lys Leu
 195 200 205

Ser Gln Thr Cys Tyr Leu Met Ala Leu Asp Ser Cys Tyr Lys His Phe
 210 215 220

Cys Ala Lys Tyr Glu Lys Phe Glu Gly Lys Gln Phe Ser Ile Ser Asp
 225 230 235 240
 Ala Glu Tyr Phe Val Phe His Ser Pro Tyr Asn Lys Leu Val Gln Lys
 245 250 255
 Ser Phe Ala Arg Leu Val Phe Asn Asp Phe Val Arg Asn Ala Ser Ser
 260 265 270
 Ile Asp Glu Thr Ala Lys Glu Lys Leu Ala Pro Phe Ser Asn Leu Ser
 275 280 285
 Gly Asp Glu Ser Tyr Gln Asn Arg Asp Leu Glu Lys Val Ser Gln Gln
 290 295 300
 Val Ala Lys Pro Leu Tyr Asp Ala Lys Val Lys Pro Thr Thr Leu Ile
 305 310 315 320
 Pro Lys Gln Val Gly Asn Met Tyr Thr Ala Ser Leu Tyr Ala Ala Phe
 325 330 335
 Ala Ser Leu Leu His Ser Lys His Thr Glu Leu Ala Gly Lys Arg Val
 340 345 350
 Thr Leu Phe Ser Tyr Gly Ser Gly Leu Thr Ala Thr Met Phe Ser Leu
 355 360 365
 Arg Leu His Glu Gly Gln His Pro Phe Ser Leu Ser Asn Ile Ala Ser
 370 375 380
 Val Met Asn Val Ala Gly Lys Leu Lys Ala Arg His Glu Leu Pro Pro
 385 390 395 400
 Glu Lys Phe Val Asp Ile Met Lys Leu Met Glu His Arg Tyr Gly Ala
 405 410 415
 Lys Asp Phe Val Thr Ser Lys Asp Cys Ser Leu Leu Ala Ser Gly Thr
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 Tyr Tyr Leu Thr Glu Val Asp Ser Leu Tyr Arg Arg Phe Tyr Ala Gln
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<210> 10

<211> 575

<212> PRT

<213> Hevea brasiliensis

<400> 10

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Pro Leu Tyr Leu Thr Asn Ala Val Phe Phe Thr Leu Phe Phe Ser Val
 35 40 45
 Ala Tyr Tyr Leu Leu His Arg Trp Arg Asp Lys Ile Arg Asn Ser Thr
 50 55 60
 Pro Leu His Ile Val Thr Leu Ser Glu Ile Val Ala Ile Val Ser Leu
 65 70 75 80
 Ile Ala Ser Phe Ile Tyr Leu Leu Gly Phe Phe Gly Ile Asp Phe Val
 85 90 95
 Gln Ser Phe Ile Ala Arg Ala Ser His Asp Val Trp Asp Leu Glu Asp
 100 105 110
 Thr Asp Pro Asn Tyr Leu Ile Asp Glu Asp His Arg Leu Val Thr Cys
 115 120 125
 Pro Pro Ala Asn Ile Ser Thr Lys Thr Thr Ile Ile Ala Ala Pro Thr
 130 135 140
 Lys Leu Pro Thr Ser Glu Pro Leu Ile Ala Pro Leu Val Ser Glu Glu
 145 150 155 160
 Asp Glu Met Ile Val Asn Ser Val Val Asp Gly Lys Ile Pro Ser Tyr
 165 170 175
 Ser Leu Glu Ser Lys Leu Gly Asp Cys Lys Arg Ala Ala Ala Ile Arg
 180 185 190
 Arg Glu Ala Leu Gln Arg Met Thr Arg Arg Ser Leu Glu Gly Leu Pro
 195 200 205
 Val Glu Gly Phe Asp Tyr Glu Ser Ile Leu Gly Gln Cys Cys Glu Met
 210 215 220
 Pro Val Gly Tyr Val Gln Ile Pro Val Gly Ile Ala Gly Pro Leu Leu
 225 230 235 240
 Leu Asn Gly Arg Glu Tyr Ser Val Pro Met Ala Thr Thr Glu Gly Cys
 245 250 255
 Leu Val Ala Ser Thr Asn Arg Gly Cys Lys Ala Ile Tyr Leu Ser Gly
 260 265 270
 Gly Ala Thr Ser Val Leu Leu Lys Asp Gly Met Thr Arg Ala Pro Val
 275 280 285
 Val Arg Phe Ala Ser Ala Thr Arg Ala Ala Glu Leu Lys Phe Phe Leu
 290 295 300
 Glu Asp Pro Asp Asn Phe Asp Thr Leu Ala Val Val Phe Asn Lys Ser
 305 310 315 320
 Ser Arg Phe Ala Arg Leu Gln Gly Ile Lys Cys Ser Ile Ala Gly Lys
 325 330 335
 Asn Leu Tyr Ile Arg Phe Ser Cys Ser Thr Gly Asp Ala Met Gly Met
 340 345 350
 Asn Met Val Ser Lys Gly Val Gln Asn Val Leu Glu Phe Leu Gln Ser
 355 360 365

Asp Phe Ser Asp Met Asp Val Ile Gly Ile Ser Gly Asn Phe Cys Ser
 370 375 380
 Asp Lys Lys Pro Ala Ala Val Asn Trp Ile Glu Gly Arg Gly Lys Ser
 385 390 395 400
 Val Val Cys Glu Ala Ile Ile Lys Glu Glu Val Val Lys Lys Val Leu
 405 410 415
 Lys Thr Asn Val Ala Ser Leu Val Glu Leu Asn Met Leu Lys Asn Leu
 420 425 430
 Ala Gly Ser Ala Val Ala Gly Ala Leu Gly Gly Phe Asn Ala His Ala
 435 440 445
 Gly Asn Ile Val Ser Ala Ile Phe Ile Ala Thr Gly Gln Asp Pro Ala
 450 455 460
 Gln Asn Val Glu Ser Ser His Cys Ile Thr Met Met Glu Ala Val Asn
 465 470 475 480
 Asp Gly Lys Asp Leu His Ile Ser Val Thr Met Pro Ser Ile Glu Val
 485 490 495
 Gly Thr Val Gly Gly Gly Thr Gln Leu Ala Ser Gln Ser Ala Cys Leu
 500 505 510
 Asn Leu Leu Gly Val Lys Gly Ala Asn Lys Glu Ser Pro Gly Ser Asn
 515 520 525
 Ser Arg Leu Leu Ala Ala Ile Val Ala Gly Ser Val Leu Ala Gly Glu
 530 535 540
 Leu Ser Leu Met Ser Ala Ile Ala Ala Gly Gln Leu Val Lys Ser His
 545 550 555 560
 Met Lys Tyr Asn Arg Ser Ser Lys Asp Met Ser Lys Ala Ala Ser
 565 570 575

<210> 11

<211> 386

<212> PRT

<213> Hevea brasiliensis

<400> 11

Met Glu Val Lys Ala Arg Ala Pro Gly Lys Ile Ile Leu Ser Gly Glu
 1 5 10 15
 His Ala Val Val His Gly Ser Thr Ala Val Ala Ala Ser Ile Asn Leu
 20 25 30
 Tyr Thr Tyr Val Thr Leu Ser Phe Ala Thr Ala Glu Asn Asp Asp Ser
 35 40 45
 Leu Lys Leu Gln Leu Lys Asp Leu Ala Leu Glu Phe Ser Trp Pro Ile
 50 55 60

Gly	Arg	Ile	Arg	Glu	Ala	Leu	Ser	Asn	Leu	Gly	Ala	Pro	Ser	Ser	Ser	
65					70					75					80	
Thr	Arg	Thr	Ser	Cys	Ser	Met	Glu	Ser	Ile	Lys	Thr	Ile	Ser	Ala	Leu	
			85						90					95		
Val	Glu	Glu	Glu	Asn	Ile	Pro	Glu	Ala	Lys	Ile	Ala	Leu	Thr	Ser	Gly	
			100					105					110			
Val	Ser	Ala	Phe	Leu	Trp	Leu	Tyr	Thr	Ser	Ile	Gln	Gly	Phe	Lys	Pro	
		115					120					125				
Ala	Thr	Val	Val	Val	Thr	Ser	Asp	Leu	Pro	Leu	Gly	Ser	Gly	Leu	Gly	
	130					135					140					
Ser	Ser	Ala	Ala	Phe	Cys	Val	Ala	Leu	Ser	Ala	Ala	Leu	Leu	Ala	Phe	
145					150					155					160	
Ser	Asp	Ser	Val	Asn	Val	Asp	Thr	Lys	His	Leu	Gly	Trp	Ser	Ile	Phe	
				165					170					175		
Gly	Glu	Ser	Asp	Leu	Glu	Leu	Leu	Asn	Lys	Trp	Ala	Leu	Glu	Gly	Glu	
			180					185					190			
Lys	Ile	Ile	His	Gly	Lys	Pro	Ser	Gly	Ile	Asp	Asn	Thr	Val	Ser	Ala	
		195					200					205				
Tyr	Gly	Asn	Met	Ile	Lys	Phe	Lys	Ser	Gly	Asn	Leu	Thr	Arg	Ile	Lys	
	210					215					220					
Ser	Asn	Met	Pro	Leu	Lys	Met	Leu	Val	Thr	Asn	Thr	Arg	Val	Gly	Arg	
225					230					235					240	
Asn	Thr	Lys	Ala	Leu	Val	Ala	Gly	Val	Ser	Glu	Arg	Thr	Leu	Arg	His	
				245					250					255		
Pro	Asn	Ala	Met	Ser	Phe	Val	Phe	Asn	Ala	Val	Asp	Ser	Ile	Ser	Asn	
			260					265					270			
Glu	Leu	Ala	Asn	Ile	Ile	Gln	Ser	Pro	Ala	Pro	Asp	Asp	Val	Ser	Ile	
		275					280					285				
Thr	Glu	Lys	Glu	Glu	Lys	Leu	Glu	Glu	Leu	Met	Glu	Met	Asn	Gln	Gly	
	290					295					300					
Leu	Leu	Gln	Cys	Met	Gly	Val	Ser	His	Ala	Ser	Ile	Glu	Thr	Val	Leu	
305					310					315					320	
Arg	Thr	Thr	Leu	Lys	Tyr	Lys	Leu	Ala	Ser	Lys	Leu	Thr	Gly	Ala	Gly	
				325					330					335		
Gly	Gly	Gly	Cys	Val	Leu	Thr	Leu	Leu	Pro	Thr	Leu	Leu	Ser	Gly	Thr	
			340					345					350			
Val	Val	Asp	Lys	Ala	Ile	Ala	Glu	Leu	Glu	Ser	Cys	Gly	Phe	Gln	Cys	
		355					360					365				
Leu	Ile	Ala	Gly	Ile	Gly	Gly	Asn	Gly	Val	Glu	Phe	Cys	Phe	Gly	Gly	
	370					375					380					
Ser	Ser															
385																

<210> 12

<211> 503

<212> PRT

<213> Hevea brasiliensis

<400> 12

Met Ala Val Val Ala Ser Ala Pro Gly Lys Val Leu Met Thr Gly Gly
1 5 10 15
Tyr Leu Ile Leu Glu Arg Pro Asn Ala Gly Ile Val Leu Ser Thr Asn
20 25 30
Ala Arg Phe Tyr Ala Ile Val Lys Pro Ile Tyr Asp Glu Ile Lys Pro
35 40 45
Asp Ser Trp Ala Trp Ala Trp Thr Asp Val Lys Leu Thr Ser Pro Gln
50 55 60
Leu Ala Arg Glu Ser Leu Tyr Lys Leu Ser Leu Lys Asn Leu Ala Leu
65 70 75 80
Gln Cys Val Ser Ser Ser Ala Ser Arg Asn Pro Phe Val Glu Gln Ala
85 90 95
Val Gln Phe Ala Val Ala Ala Ala His Ala Thr Leu Asp Lys Asp Lys
100 105 110
Lys Asn Val Leu Asn Lys Leu Leu Leu Gln Gly Leu Asp Ile Thr Ile
115 120 125
Leu Gly Thr Asn Asp Phe Tyr Ser Tyr Arg Asn Glu Ile Glu Ala Cys
130 135 140
Gly Leu Pro Leu Thr Pro Glu Ser Leu Ala Ala Leu Pro Ser Phe Ser
145 150 155 160
Ser Ile Thr Phe Asn Val Glu Glu Ala Asn Gly Gln Asn Cys Lys Pro
165 170 175
Glu Val Ala Lys Thr Gly Leu Gly Ser Ser Ala Ala Met Thr Thr Ala
180 185 190
Val Val Ala Ala Leu Leu His His Leu Gly Leu Val Asp Leu Ser Ser
195 200 205
Ser Cys Lys Glu Lys Lys Phe Ser Asp Leu Asp Leu Val His Ile Ile
210 215 220
Ala Gln Thr Ala His Cys Ile Ala Gln Gly Lys Val Gly Ser Gly Phe
225 230 235 240
Asp Val Ser Ser Ala Val Tyr Gly Ser His Arg Tyr Val Arg Phe Ser
245 250 255
Pro Glu Val Leu Ser Ser Ala Gln Asp Ala Gly Lys Gly Ile Pro Leu
260 265 270

Gln Glu Val Ile Ser Asn Ile Leu Lys Gly Lys Trp Asp His Glu Arg
 275 280 285
 Thr Met Phe Ser Leu Pro Pro Leu Met Ser Leu Leu Leu Gly Glu Pro
 290 295 300
 Gly Thr Gly Gly Ser Ser Thr Pro Ser Met Val Gly Ala Leu Lys Lys
 305 310 315 320
 Trp Gln Lys Ser Asp Thr Gln Lys Ser Gln Glu Thr Trp Arg Lys Leu
 325 330 335
 Ser Glu Ala Asn Ser Ala Leu Glu Thr Gln Phe Asn Ile Leu Ser Lys
 340 345 350
 Leu Ala Glu Glu His Trp Asp Ala Tyr Lys Cys Val Ile Asp Ser Cys
 355 360 365
 Ser Thr Lys Asn Ser Glu Lys Trp Ile Glu Gln Ala Thr Glu Pro Ser
 370 375 380
 Arg Glu Ala Val Val Lys Ala Leu Leu Gly Ser Arg Asn Ala Met Leu
 385 390 395 400
 Gln Ile Arg Asn Tyr Met Arg Gln Met Gly Glu Ala Ala Gly Val Pro
 405 410 415
 Ile Glu Pro Glu Ser Gln Thr Arg Leu Leu Asp Thr Thr Met Asn Met
 420 425 430
 Asp Gly Val Leu Leu Ala Gly Val Pro Gly Ala Gly Gly Phe Asp Ala
 435 440 445
 Val Phe Ala Val Thr Leu Gly Asp Ser Gly Thr Asn Val Ala Lys Ala
 450 455 460
 Trp Ser Ser Leu Asn Val Leu Ala Leu Leu Val Arg Glu Asp Pro Asn
 465 470 475 480
 Gly Val Leu Leu Glu Ser Gly Asp Pro Arg Thr Lys Glu Ile Thr Thr
 485 490 495
 Ala Val Phe Ala Val His Ile
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<210> 13

<211> 415

<212> PRT

<213> Hevea brasiliensis

<400> 13

Met Ala Glu Ser Trp Val Ile Met Val Thr Ala Gln Thr Pro Thr Asn
 1 5 10 15
 Ile Ala Val Ile Lys Tyr Trp Gly Lys Arg Asp Glu Lys Leu Ile Leu
 20 25 30

Pro Val Asn Asp Ser Ile Ser Val Thr Leu Asp Pro Ala His Leu Cys
 35 40 45
 Thr Thr Thr Thr Val Ala Val Ser Pro Ser Phe Ala Gln Asp Arg Met
 50 55 60
 Trp Leu Asn Gly Lys Glu Ile Ser Leu Ser Gly Gly Arg Tyr Gln Asn
 65 70 75 80
 Cys Leu Arg Glu Ile Arg Ala Arg Ala Cys Asp Val Glu Asp Lys Glu
 85 90 95
 Arg Gly Ile Lys Ile Ser Lys Lys Asp Trp Glu Lys Leu Tyr Val His
 100 105 110
 Ile Ala Ser Tyr Asn Asn Phe Pro Thr Ala Ala Gly Leu Ala Ser Ser
 115 120 125
 Ala Ala Gly Phe Ala Cys Leu Val Phe Ala Leu Ala Lys Leu Met Asn
 130 135 140
 Ala Lys Glu Asp Asn Ser Glu Leu Ser Ala Ile Ala Arg Gln Gly Ser
 145 150 155 160
 Gly Ser Ala Cys Arg Ser Leu Phe Gly Gly Phe Val Lys Trp Lys Met
 165 170 175
 Gly Lys Val Glu Asp Gly Ser Asp Ser Leu Ala Val Gln Val Val Asp
 180 185 190
 Glu Lys His Trp Asp Asp Leu Val Ile Ile Ile Ala Val Val Ser Ser
 195 200 205
 Arg Gln Lys Glu Thr Ser Ser Thr Thr Gly Met Arg Glu Thr Val Glu
 210 215 220
 Thr Ser Leu Leu Leu Gln His Arg Ala Lys Glu Ile Val Pro Lys Arg
 225 230 235 240
 Ile Val Gln Met Glu Glu Ser Ile Lys Asn Arg Asn Phe Ala Ser Phe
 245 250 255
 Ala His Leu Thr Cys Ala Asp Ser Asn Gln Phe His Ala Val Cys Met
 260 265 270
 Asp Thr Cys Pro Pro Ile Phe Tyr Met Asn Asp Thr Ser His Arg Ile
 275 280 285
 Ile Ser Cys Val Glu Lys Trp Asn Arg Ser Val Gly Thr Pro Gln Val
 290 295 300
 Ala Tyr Thr Phe Asp Ala Gly Pro Asn Ala Val Leu Ile Ala His Asn
 305 310 315 320
 Arg Lys Ala Ala Ala Gln Leu Leu Gln Lys Leu Leu Phe Tyr Phe Pro
 325 330 335
 Pro Asn Ser Asp Thr Glu Leu Asn Ser Tyr Val Leu Gly Asp Lys Ser
 340 345 350
 Ile Leu Lys Asp Ala Gly Ile Glu Asp Leu Lys Asp Val Glu Ala Leu
 355 360 365

Pro Pro Pro Pro Glu Ile Lys Asp Ala Pro Arg Tyr Lys Gly Asp Val
 370 375 380
 Ser Tyr Phe Ile Cys Thr Arg Pro Gly Gln Gly Pro Val Leu Leu Ser
 385 390 395 400
 Asp Glu Ser Gln Ala Leu Leu Ser Pro Glu Thr Gly Leu Pro Lys
 405 410 415
 <210> 14
 <211> 232
 <212> PRT
 <213> Hevea brasiliensis

 <400> 14
 Met Ala Pro Ala Ala Ala Thr Ala Val Ala Ala Glu Ile Lys Pro Arg
 1 5 10 15
 Asp Val Cys Ile Val Gly Val Ala Arg Thr Pro Met Gly Gly Phe Leu
 20 25 30
 Gly Ser Leu Cys Thr Leu Ser Ala Thr Lys Leu Gly Ser Ile Ala Ile
 35 40 45
 Glu Ala Ala Leu Lys Arg Ala Asn Val Asp Pro Ser Leu Val Gln Glu
 50 55 60
 Val Phe Phe Gly Asn Val Leu Ser Ala Asn Leu Gly Gln Ala Pro Ala
 65 70 75 80
 Arg Gln Ala Ala Leu Gly Ala Gly Ile Pro Asn Ser Val Val Cys Thr
 85 90 95
 Thr Val Asn Lys Val Cys Ala Ser Gly Met Lys Ala Thr Met Leu Ala
 100 105 110
 Ala Gln Ser Ile Gln Leu Gly Ile Asn Asp Val Val Val Ala Gly Gly
 115 120 125
 Met Glu Ser Met Ser Asn Ala Pro Lys Tyr Leu Ala Glu Ala Arg Lys
 130 135 140
 Gly Ser Arg Leu Gly His Asp Ser Leu Val Asp Gly Met Leu Lys Asp
 145 150 155 160
 Gly Leu Trp Asp Val Tyr Asn Asp Val Gly Met Gly Ser Cys Ala Glu
 165 170 175
 Ile Cys Ala Asp Asn His Ser Ile Thr Arg Glu Asp Gln Asp Lys Phe
 180 185 190
 Ala Ile His Ser Phe Glu Arg Gly Ile Ala Ala Gln Glu Ser Gly Ala
 195 200 205
 Phe Ala Trp Glu Ile Val Pro Val Glu Val Ser Lys Gly Gln Gly Gly
 210 215 220

Asn Tyr Asp Trp His Val Gly Cys
225 230

<210> 15

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<221> misc_feature

<223> primer

<400> 15
acctacaaca aagctctcat caacc

25

<210> 16

<211> 25

<212> DNA

<213> Artificial Sequence

<400> 16
gcaatgtaac atcagagatt ttgag

25